

# GE Feedback on MGSTF Design Components

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- GE compared PJM requested design components against the next Generation Electricity Markets (nGEM) Market Clearing Engine (MCE) product which includes the Enhance Combined Cycle model and classified the items into three buckets
  - Included in Base Scope (PJM to provide timeline)
  - PJM Custom (PJM to provide timeline)
  - Significant Performance Impacts

Note - SCUC is Security-Constrained Unit Commitment and refers to the unit commitment portion of the DA and RT clearing engines.

The model will allow Market Sellers to offer one or more configurations.

- A configuration is a subset of one market ID
- Any change in a unit's operating mode that requires a hold/transition time will be modeled as a separate configuration (*GE - offline is not a valid configuration*)
- Each configuration is a physical arrangement of operating plant components that have the characteristics of a unit.
  - i.e. one dispatch range, No-Load cost, Eco Min, Eco Max, Emergency Min, Emergency Max, Hot/Intermediate/cold Start-up Time, Hot/Intermediate/Cold Start-Up Costs, Minimum Run Time (*GE – Minimum Down Time?*)
- Market Sellers must offer the same configurations in DA and RT
- Market Sellers can make configurations available and unavailable intraday

The model will allow Market Sellers to model transitions.

- Transitions are the number of hours required in real time operations to change between configurations where the unit is unable to follow PJM dispatch. A unit must have already completed a start-up and Soak Time (if applicable) before it can provide a transition. *(GE – MCE differentiates startup from offline and transition between configurations)*
- Transitions can only be whole hours in DA *(entered in Markets Gateway as hour and minutes, but DA engine rounds up to whole hour)*
- RT will use the actual transition times entered into Markets Gateway
- There are no costs to transition down to a lower configuration.
- Transition times and costs can be updated Intra-Day.

The model will allow Market Sellers to model transitions.

- Units can provide regulation during transitions.
- Units can provide synchronized reserves during transitions.
- Units can provide DASR during transitions. *(GE – MCE is configurable to allow or disqualify reserves during transitions.) (PJM to check with GE if this is configurable on unit specific basis)*

The Day Ahead model includes:

- PJM can start-up into and shutdown from any configuration.
- Transitions will be awarded in whole hours at the MWs values provided by Market Seller in Markets Gateway

The Real Time model includes:

- PJM can start-up into and shutdown from any configuration.

The model will allow Market Sellers to offer one or more configurations

- Each configuration will have the following schedules available for Dispatch:
  - 1 price schedule, 1 price parameter limited schedule, & 12 cost schedules (*GE – supported by multiple-schedule model*)



The model will allow Market Sellers to model transitions:

- Market Sellers will have the ability to specify a Hot/Intermediate/Cold Transition matrix which allows them to specify the time and costs to transition into and out of each configuration. *(GE – MCE supports one transition matrix between configurations (physical operating modes) regardless of schedules. Both MISO and SPP use the single transition matrix model.)*
- Units in Transition will be dispatched and settled on the higher configuration schedule *(GE - needs clarification. PJM – higher configuration schedule terminology is confusing, need to specify the schedule a unit is transitioning to because unit could be transitioning to a lower schedule.)*



The model will allow Market Sellers to model transitions:

- Market Sellers will have the ability to specify the MWhs produced during a transition. (GE – MCE allows transitions to be fully dispatched in DA and fixed at SE MWs in RT. Transition MWh profile will have to be added.)

## Day Ahead Customization:

- PJM will optimize configurations awards in the DA including fuel switching.
- Minimum Run Time will only be respected in a downward direction. A unit can be dispatched into a higher configuration before the Minimum Run Time has been met.

## Real Time Customization:

- ASO/IT/LT SCED makes commitments/recommendations to switch configurations.
- Minimum Run Time will only be respected in a downward direction. A unit can be dispatched into a higher configuration before the Minimum Run Time has been met.
- ASO will have the ability to assign Synchronized Reserve MWs to units in transition. It will be transition time dependent. *(GE – ASO is a PJM customization)*

The model will allow Market Sellers to offer one or more configurations

- Market units may have a minimum of 1 configuration and a maximum of 10 configurations. *(GE - MCE does not limit the number of configurations. The number of configurations could impact SCUC performance. Adding Soak Time, multiple schedule, and multiple transition matrices will have a significant impact on SCUC performance.) (PJM to check with SPP on how many units using 3 configurations and what can be improved with hardware improvements)*
- Each configuration will have the following schedules available for Dispatch:
  - 1 price schedule per fuel type, 1 price parameter limited schedule per fuel type, & 12 cost schedules *(GE – Multiple schedules for each configuration makes the problem challenging and will affect the performance of DA SCUC and IT SCUC logic)*

The model will allow Market Sellers to model transitions:

- Market Sellers will have the ability to specify a Hot/Intermediate/Cold Transition matrix which allows them to specify the time and costs to transition into and out of each configuration. *(GE – warm state differentiation for transition matrix makes the logic more complicated. Adding multiple matrices for each temperature state will significantly impact performance.)*
- Transition matrix can be priced based, price based PLS, and cost based. *(GE – MCE supports one transition matrix between (physical) configurations regardless of schedule. Adding multiple matrices for different schedules will significantly impact performance.)*

The model will allow Market Sellers to model transitions:

- Transitions can be used to model fuel switching. (*GE – multiple schedule based transition matrices will impact performance.*)
- Transition times and MWhs can be ambient temperature dependent. (*GE - multiple temperature based transition matrices will impact performance.*)

- GE's MCE has only one transition matrix. It is not:
  - State dependent (hot/intermediate/cold)
  - Schedule dependent (price/price PLS/cost)
  - Fuel dependent
  - Ambient temperature dependent
  - This is most significant limitation identified by GE
- Multiple-Schedule Model performance impacted by Soak Time and number of configurations.
  - What is the maximum number of configurations needed?
  - Time, MW, Cost are the components for transition matrix